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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

LEADER, WILLIAM T

ART UNIT	PAPER NUMBER
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1742

DATE MAILED: 10/08/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/010,954

Applicant(s)

PATTON ET AL.

Examiner

William T. Leader

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-62 is/are pending in the application.
- 4a) Of the above claim(s) 31-62 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 5-30 is/are rejected.
- 7) ☒ Claim(s) 3 and 4 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4-7.
- 4) ☒ Interview Summary (PTO-413) Paper No(s). 8.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

I. Claim 1-30, drawn to an apparatus for engaging a workpiece during an electrolytic process, classified in class 204, subclass 229.8 .

II Claims 31-62, drawn to a method for electroplating a workpiece having a seed layer, classified in class 205, subclass 81.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the process of the Group II claims can be performed using apparatus other than that of the Group I claims. For example, rather than using a cup plating apparatus as recited in claim 1, the process could be carried out by immersing the workpiece in a plating tank filled with electrolyte.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with Jeff Weaver on September 12, 2003, a provisional election was made with traverse to prosecute the invention of Group I, claims 1-30. Affirmation of this election must be made by applicant in replying to this Office action. Claims 31-62 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 8 and 10 contains the trademark/trade name Chemraz, Tefzel, Sifel, Viton, Kalrez, Isocon and SinEtsu. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is

uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is used to identify/describe an elastomer and embedded contacts and, accordingly, the identification/description is indefinite.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35

U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35

U.S.C. 103(a).

9. Claims 1, 5, 6, 14-16, 20 and 26-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Contolini et al (6,159,354) in view of Hongo et al (6,517,689).

10. The Contolini et al patent is directed to apparatus for electroplating onto a semiconductor wafer. The apparatus includes a cup 70 with an interior region and a lip within the interior region for supporting the wafer. Figure 2A is cross-sectional view of cup 70 with a wafer mounted therein. A plurality of electrical contacts 78 is arranged about the lip of the cup. The apparatus further includes cone 34. The wafer mounted in the cup is pressed down onto a compliant seal by the cone (column 7, lines 1-3.

11. The apparatus of instant claim 1 differs from that of Contolini et al by reciting a first and second plurality of electrical contacts wherein a first circuit contains the first plurality of contacts, a second circuit contains the second plurality of contacts, and the second circuit is isolated from the first circuit. The Hongo et al patent is directed to apparatus for electroplating onto semiconductor wafers which includes a conduction detection device that can detect electrical conductivity of the contacts which feed electrical power to the wafer and the conductive layers on the substrate (abstract). A plurality of electrical contacts 15 is provided to transmit

power to the peripheral edge of the wafer during electroplating. See figure 5.

Hongo et al disclose a switching arrangement allowing the contacts to be selectively connected to either the electroplating power supply or to a resistance measuring circuit. See figure 10 and column 6, lines 5-34). The switches may be operated to connect a first plurality of the contacts to the electroplating power supply and a second plurality of contacts to resistance measuring circuits.

12. The prior art of record is indicative of the level of skill of one of ordinary skill in the art. It would have been obvious at the time the invention was made to have provided independent circuits for first and second pluralities of contacts in the apparatus of Contolini et al as taught by Hongo et al because the conductivity of the contacts and conductive layers on the wafer could have been measured.

13. The apparatus of Contolini et al and Hongo et al are both adapted to treat semiconductor wafers, meeting the limitation of instant claim 5. As noted above, a seal is provided on the lip of Contolini et al, meeting the limitation of instant claim 6. Contolini et al disclose that the seed layer may be copper meeting the limitation of instant claim 20 (column 4, lines 62-63). The cup of Contolini et al may be formed of an electrically insulating material like a plastic such as polyvinylidene fluoride (PVDF) or polyvinyl chloride (CPVC). This meets the limitations in the Markush groups of claims 14-16. Hongo et al disclose that the resistance measuring device is comprised of four contact resistance measuring circuits 41-1 to 41-4. Each

resistance measuring circuit is connected to a contact. Thus, Hongo et al suggest an arrangement in which there are four contacts in the second plurality of contacts, meeting the limitations of instant claims 26 and 27. Hongo et al provide plating current detection circuit 38 which allows the plating current through each of the contacts 15 to be individually controlled (column 7, lines 15-23) meeting the limitation of instant claim 28.

14. Claims 2, 21, 22, 29 and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Contolini et al (6,159,354) in view of Hongo et al (6,517,689) as applied to claims 1, 5, 6, 14-16, 20 and 26-28 above, and further in view of Landau (6,261,433) and Brodsky (6,267,860).

15. Claim 2 additionally differs from the apparatus of Contolini et al by reciting that each contact of the first plurality comprises a resistor. The Landau patent is directed to an electrochemical deposition system for plating onto semiconductor wafers. Landau teaches that as the contact pin-to- substrate interface resistance varies between pin locations, more current will flow, and thus more plating will occur, at the site of lowest resistance. However, by placing an external resistor in series with each contact pin, the quantity of electrical current passed through each contact pin becomes controlled mainly by the value of the external resistor because the overall resistance of each contact pin-substrate contact plus the control resistor

branch of the power supply to substrate circuit is substantially equal to that of the control resistor. As a result, the variations in the electrical properties between each contact pin do not affect the current distribution on the substrate, and a uniform current density results across the plating surface which contributes to uniform plating thickness. Preferably the resistance value of the external resistor is greater than 5 ohms (column 7, line 39 to column 8, line 14). This value falls within the range recited in instant claim 21 and suggest the value recited in instant claim 22.

16. The Brodsky patent is directed to a method and apparatus for electroplating. Brodsky observes that there was a disparity in plating current between different contacts to the workpieces being electroplated. To overcome this disparity, a resistor is provided between the current feeding members 14 and 15 and each workpiece. The electrical contact 33 itself can act as the resistor (column 3, line 66 to column 4, line 3). This positions the resistor adjacent the workpiece. It would have been obvious to have included a resistor in each contact in the apparatus of Contolini et al because the current flow through each contact would have been made more uniform as taught by Landau and Brodsky resulting in more uniform deposition. Based on the explanation of the function of the resistors in Landau and Brodsky, choice of resistance values and resistor position would have been a matter of routine optimization within the skill of one of ordinary skill in the art.

17. Claims 7, 8, 9 and 23-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Contolini et al (6,159,354) in view of Hongo et al (6,517,689) as applied to claims 1, 5, 6, 14-16, 20 and 26-28 above, and further in view of Fluegel et al (6,627,052).

18. Claims 7 and 8 additionally differ from the apparatus of Contolini et al by reciting particular seal materials. The Fluegel et al patent is directed to apparatus for electroplating onto semiconductor wafers. The apparatus includes clamshell 33 which comprises cone 32 and cup 34. A wafer is mounted therein (column 4, lines 15-22). A compliant seal material is disposed on the carrier which faces the wafer. In the embodiment shown in figure 5C, a conductive elastomer CE is utilized to make contact all along its length with the seed layer (column 5, lines 25-32). A known elastomer is Viton (column 5, line 54). It would have been obvious at the time the invention was made to have utilized an elastomer for the seal in the apparatus of Contolini et al as taught by Fluegel et al because an effective seal would have been created. Instant claim 9 recites that the contacts are embedded in the elastomer seal. By disclosing a conductive elastomer Fluegel et al meet this limitation.

19. Claims 23-25 differ from the apparatus of Contolini et al by reciting the number of contacts. Fluegel et al further disclose that 128 discrete contacts can be used (column 1, lines 26-28). This number of contacts falls within the range recited

in instant claim 23 and equals the number recited in instant claim 24. As noted above, Fluegel et al also disclose the use of a conductive seal which forms a continuous contact all around the periphery of the wafer. It would have been obvious to have used a large number of contacts as taught by Fluegel et al in the apparatus of Contolini et al. Based on the desirability of uniform plating and the teaching of Fluegel et al, the choice of the number of contacts needed to have provided a uniform deposit would have been a matter of routine optimization. As the size of the wafer is increased, the circumference increases, and the number of contacts needed to maintain the same spacing between contacts necessarily increases.

20. Claims 9-13 and 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Contolini et al (6,159,354) in view of Hongo et al (6,517,689) and further in view of Fluegel et al (6,627,052) as applied to claims 7, 8 and 23-25 above, and further in view of Tamaki et al (5,853,559) and Landau (6,261,433).

21. As noted above, claim 9 recites that the contacts are embedded in the elastomer seal. The Tamaki et al patent is directed to apparatus for electroplating onto a semiconductor substrate. As shown in figure 2, seal 11 is positioned against the outer peripheral edge of the wafer. The seal includes contact pins 10 in the shape of wires embedded therein (column 4, lines 4-8). This meets the limitations of

instant claims 9, 10 and 12. Fluegel et al further discloses that the contacts may be made of a mixture of copper and beryllium (column 5, lines 38-41). This meets the limitation of instant claim 11. It would have been obvious at the time the invention was made to have utilized a seal with embedded conductors in the apparatus of Contolini et al as taught by Tamaki et al because plating current would have been efficiently transferred to the wafer. Choice of the diameter of the wire conductors would have been a matter of routine optimization based on the recognition that the seal must be sufficiently flexible to prevent leakage of the electrolyte while providing sufficient conductivity to pass the required plating current.

22. Claims 17-19 specify the width of the seal and the location of the seal at the wafer's outermost circumferential edge. Landau further discloses that the contacts should touch the seed layer on the wafer as close as practically possible to the edge to minimize the wasted area on the wafer (column 3, lines 47-51). Based on this teaching, the choice of width of the seal would have been a matter of routine optimization based on the need to make the diameter of the seal sufficiently large to prevent leakage of electrolyte while minimizing the wasted area on the surface of the wafer as taught by Landau.


23. Claims 3 and 4 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the

limitations of the base claim and any intervening claims. Claims 3 and 4 recite the use of a thick-film resistor. This feature is not suggested by the prior art of record.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 703-308-2530. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 703-308-1146. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.


William Leader
September 26, 2003


ROY KING
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